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Evaluating the predictions of three syntactic frameworks for mixed determiner–noun constructions

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Abstract: This paper presents a comparative evaluation of three linguistic frameworks, the Minimalist Programme (MP), Word Grammar (WG) and the Matrix Language Frame Model (MLF), regarding their predictions of possible combinations in a corpus of 187 German–English code-switched (CS) determiner–noun constructions. The comparison revealed a significant difference in the accuracy of the predictions between the MP and WG, but not between the other frameworks. We draw attention to the fact that while WG and MP deal with the processes of feature agreement between determiner and noun, the MLF is concerned with a broader notion of agreement in language membership. We suggest that advances in our understanding of grammaticality in code-switching will be achieved by combining the insights of all three frameworks instead of considering them in isolation.

Keywords: Minimalist Programme, Word Grammar, Matrix Language Frame Model, DP/NP, code-switching

1 Introduction

One of the most common sites for intrasentential code-switching between languages turns out to be between a determiner and a noun, as in *die nurses* 'the nurses' where the (plural) determiner is from German and the noun from English. Timm (1975: 479) reports that "NPs of the type D(eterminer) + N are highly 'switchable'" and Jake et al. (2002: 72) report that "mixed NPs, with a

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determiner from one language and a noun from another ... form the bulk of all observed Spanish-English CS data". The frequent occurrence of this kind of mixed structure is a particularly interesting fact since the switch occurs within a construction where the determiner and noun may be linked by agreement processes which differ cross-linguistically. Furthermore, the determiner appears to match the grammatical frame of the clause. At present there are contrasting theories to account for aspects of the observed data, but no overarching theory to account for all. In what follows we shall compare the accuracy of the predictions of the MP, WG and the MLF in relation to 187 mixed German–English constructions in order to identify the strengths and weaknesses of each approach.

Kuhn (1970: 150) argues that "competing paradigms" are incommensurable, saying "the proponents of competing paradigms practice their trades in different worlds". It is the sense of different worlds even within linguistic theory which may explain the paucity of work which tries to compare different approaches, but we argue that comparison is not impossible if a theory-neutral unit of analysis can be established. For our work this will be what we call the *determiner–noun construction*, or a phrase consisting of a determiner and a noun (also called DP or NP). We extend work by Herring et al. (2010) who evaluated the predictions of the MLF and MP regarding mixed nominal constructions in Spanish-English and Welsh-English data. Unlike Herring et al. (2010) we will assume that the MLF model can identify the ML in fragments (i. e. phrases in data that are not full clauses). We will add Word Grammar (Hudson 2010) to the other two frameworks in order to conduct a three-way comparison, and we will focus on data from Eppler's German–English corpus (Eppler 2003).

2 Background

2.1 Code-switching within the determiner–noun construction

Intraclausal code-switching (see Deuchar [2012] for a general introduction) is the use of elements from two or more languages in one utterance. Below we provide examples of clauses containing different combinations of determiner and noun in mixed determiner–noun constructions from Eppler's German–English corpus. (The numbers after the examples refer to the data set compiled for this study which may be found in the Appendix.)

(1) Ich war nicht in der **resistance** (22)
1SG be.PST NEG in DETD.DAT.SG.F N.SG[1]
'I wasn't in the resistance'

(2) dann verliert man den **accent** (54)
ADV lose.3SG.PRS one DETD.ACC.SG.M N.SG
'then you lose the (your) accent'

In examples (1) and (2) English nouns are inserted into otherwise German utterances, right after German definite determiners. German determiner-(adjective)–noun constructions exhibit number (singular and plural), grammatical gender (masculine, feminine and neuter) and case (nominative, accusative, genitive and dative) agreement. All three features are marked by inflections, but there is a considerable amount of syncretism.[2] In example (1) the determiner *der* encodes the features masculine, singular and nominative whereas in example (2) *den* encodes masculine, singular and accusative.

In example (1) the determiner is marked with feminine gender and dative case, as the gloss shows. Although there is no grammatical gender in English, and the English word *resistance* therefore has none, the obligatory gender-marking on German determiners means that one of three genders must be assigned to the determiner. As we can see it has been assigned feminine gender. In example (2) a masculine determiner is used and the case is accusative as with most direct objects of verbs.

In the data we also have examples of a German noun being inserted into an otherwise English utterance. This is illustrated in example (3):

(3) I had English at school # **at the** Handels-akademie[3] (1)
1SG have.PST English at school # at DETD N-N.SG.F
'I had English at school, at the trade-academy'

1 Key to glosses: 1 = 1st person; 2 = 2nd person; ACC = accusative; ADJ = adjective; ADV = adverb(ial); COND = conditional; DAT = dative; DET = determiner; DETD = definite determiner; DETID = indefinite determiner; *F* = feminine; FUT = future; GEN = genitive; IMPER = imperative; IPFV = imperfective; *M* = masculine; *N* = neuter; M/N = masculine or neuter; NEG = negation/negative; NFIN = non-finite; NOM = nominative; PAST = past; PL = plural; POSS = possessive pronoun; PRON = pronoun; PRS = present; PRT = particle; SG = singular.

2 A single (inflected) form corresponds to more than one morphosyntactic description. For example, *Mensch* ('human being(s)') when inflected with *–en* as in *Menschen* could be an accusative, genitive or dative singular noun or else a plural noun in one of all four possible cases.

3 In accordance with CHAT transcription conventions, only proper nouns are transcribed with a capital letters, also in German.

In English the determiner marks neither case nor grammatical gender; some English determiners however (e. g. *this, these*) overtly agree with nouns in number, most commonly marked by the addition of a plural -s suffix.

The two languages involved in code-switching in this German/English corpus bring different requirements to determiner–noun constructions and different combinations can therefore be expected in mixed constructions (D_E-N_G and D_G-N_E) from a theory-neutral abstract point of view. German nouns exhibit number and grammatical gender and in monolingual German the determiners they combine with need to agree in both features. When German nouns combine with an English determiner, only number agreement can be marked on some English determiners (demonstratives), because English determiners do not exhibit grammatical gender. German furthermore marks the function of determiner–noun constructions in the sentence with case on both the determiner and the noun. English has lost case marking during its history (with the exception of pronouns which cannot combine with determiners such as *she*, *her*). When a German noun combines with an English determiner, case can only be marked morphologically on the German noun. When English nouns combine with a German determiner in mixed constructions, agreement in number is expected because both languages have this feature. English nouns do not have grammatical gender, yet gender is an obligatory feature of German determiners. There are several possibilities how this cross-linguistic contrast could be resolved in mixed determiner–noun constructions. English nouns could not combine with German determiners at all, or they could only combine with German determiners with a default gender. Most studies of German/English code-switching within the determiner–noun construction show that German determiners that combine with English nouns are categorically marked for one of the three German grammatical genders (see example [1] *die resistance* f. and [2] *der accent* m., Section 2.2 in this article, and Duran Eppler 2010 for a literature review). As case establishes the external relation of the determiner–noun construction with the sentence in which it occurs, case marking on German determiners combined with English nouns in mixed constructions is expected. The preferred combinations predicted by the different frameworks under evaluation in this paper will be discussed in Sections 3.1–3.3.

2.2 Previous work on code-switching within the determiner–noun construction

Much previous work on mixed determiner–noun constructions focuses on gender agreement. Clyne (1969), for example, investigated factors determining

the choice of German articles followed by English nouns in the speech of German immigrants in Australia and concluded that phonological similarity between the English noun and one or more German nouns was an important factor influencing the gender of the article. Like Clyne, Fuller and Lehnert (2000) were interested in the factors determining gender assignment to English nouns preceded by German articles, and also in article use where English and German differed from one another. They found that phonological factors were not quite as important as Clyne's work suggested, and that semantic and morphological motivations took priority over these.

As part of a systematic investigation of syntactic relations in German/English bilingual speech, Duran Eppler (2010) also investigated agreement evidence in mixed determiner–noun constructions. The corpus this study is based on contains more instances of D_G-N_E than D_E-N_G. Like Clyne and Fuller and Lehnert, she found that gender and number agreement were established categorically for English nouns that combine with German determiners, but that there was no evidence for morphologically marked case assignment on English nouns. In terms of gender assignment Duran Eppler found that phonological factors were frequently overridden by morphological and semantic factors, a finding which supports Fuller and Lehnert's rather than Clyne's work.

González-Vilbazo (2005) analysed DPs in a CS variety of Spanish and German. In this case both participating languages have a grammatical gender system. He proposes a principle of congruence according to which the gender of the noun in the language of origin determines the form of the article, which must agree in gender. Thus feminine Spanish nouns take feminine German articles and feminine German nouns take feminine Spanish articles. Masculine and neuter German nouns (specified as [-FEM]) take masculine Spanish articles (also [-FEM]). Spanish masculine nouns are matched with forms of the German article which are ambiguous between masculine and neuter, e. g. *dem* (masculine and neuter dative singular) to avoid congruence violations.

Liceras et al. (2008) deal with a pair where only one language has gender, Spanish/English DPs. Like Duran Eppler (2010), they found that production data by balanced bilinguals showed more instances of determiner from language with more syntactic features (Spanish) followed by noun from language with fewer features (English) than vice versa. Regarding the gender of the Spanish determiner when followed by an English noun, they found that balanced bilingual adults preferred a default masculine determiner, whereas L1 Spanish learners of English preferred a feminine determiner where the translation equivalent was feminine.

Parafita Couto et al. (2014) also deal with gender assignment in mixed DPs in a language pair (Spanish/Basque) where only one of the languages (Spanish)

has grammatical gender. The surprising result that feminine gender appeared to be the default was accounted for by morpho-phonological factors.

Herring et al. (2010) examined Spanish/English and Welsh/English data in order to compare the coverage[4] and the accuracy of predictions made by the Matrix Language Framework (MLF) and the Minimalist Program (MP) on the source language of the determiner in mixed DPs. Their data consisted of 225 mixed Welsh/English DPs and 148 mixed Spanish English DPs. They found that the MP predictions achieved greater coverage of the data, because they assumed that the MLF could only make predictions where the whole clause including the verb was available. On the other hand, for the data which both approaches covered, the MLF appeared to be more accurate. This was due to the fact that the MP was accurate wherever the determiner came from the language with grammatical gender (Welsh or Spanish) but not where it came from English.

2.3 Overview of the three frameworks to be evaluated

The Minimalist Program (MP) (e. g. Chomsky 1995; Boeckx 2006) is a mode of syntactic inquiry, developed for English and many other languages and applied to bilingual data by MacSwan (e. g. 1999, 2000, 2009). Word Grammar (WG) is a theory of language structure, mainly developed on English and applied to bilingual language use by Eppler (2006) and Duran Eppler (2010). The Matrix Language Frame (MLF) model is a competence and production model for bilingual and multilingual language use developed by Myers-Scotton and collaborators (e. g. 1993, 1995, 2002).

2.3.1 The Minimalist Program (MacSwan 1999, 2000, 2005, in press)

The MP is a family of generative approaches to syntax that share core assumptions and guiding intuitions (Boeckx 2006). We assume MacSwan's Minimalist approach to code-switching (2000, 2005) for the purposes of our evaluation.

The syntactic component of language consists of two parts in the MP:

- a lexicon, to which the idiosyncratic differences observed across languages are attributed
- a computational system (CHL) believed to be invariant across languages.

4 Coverage refers to the proportion of the data a model can make predictions about regarding well-formedness.

Phrase structure is derived from the lexicon in the MP. The operation Select picks lexical items from the lexicon and introduces them into a Numeration or Lexical Array (LA). Another operation, Merge (Chomsky 1991, 1995; see Figure 1), then takes two lexical items (α and β) from the LA and constructs a new object γ: {α β} in a hierarchical syntactic structure, i. e. one of the two lexical items wins and is projected as the head.

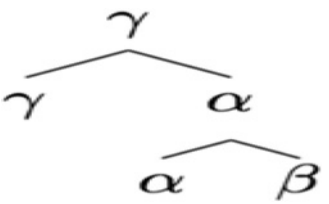

Figure 1: Hierarchical structure building though merge in MP (Boeckx 2006).

In other words, phrase structure trees are built derivationally by the application of the operations Select and Merge. Crucially for our study, this process is constrained by the condition that lexically encoded features (like number, grammatical gender, case etc.) match in the course of a derivation. Merge builds hierarchical structures (see Figure 1) based on the specification of lexically encoded features. Uninterpretable features, i. e. purely syntactic properties without relevance at the level of mental representation (LF), like case and gender, need to be checked. Feature checking is a relation between two elements, such as a determiner and a noun, such that one or more designated features they share can be checked against each other and then deleted. If features cannot be checked or do not match, the derivation crashes.

According to MacSwan the analysis of code-switching in the Minimalist Program does not need to refer to any special principles or constraints involving code-switching: "there are no statements, rules or principles of grammar which refer to CS". Instead, "all of the facts of CS may be explained just in terms of principles and requirements of the specific grammars used in each case" (MacSwan 2009: 325). According to this approach, "lexical items may be drawn from the lexicon of either language to introduce features into the lexical array, which must then be valued … in just the same way as monolingual features must be valued … no CS-specific mechanism is required to mediate contradictory requirements of the systems in contact" (MacSwan 2009: 326). We outline the specific predictions for our data in Section 3 below.

2.3.2 Word Grammar (Hudson 1990, 2007, 2010)

WG is a cognitive dependency grammar (Tesnière 1959; Fraser and Corbett 1994) developed by Hudson (1990, 2010). Dependencies are directed, labelled graph structures which represent hierarchical relations between two linguistic units (single words in WG, see Figure 2 below). Individual dependency links are asymmetrical, with one of the two units acting as the head and the other as the dependent, and one word depending on the other for its link to the rest of the sentence. The type of dependency relation is indicated using a label on top of the arc linking the two units (Mel'čuck 2003; Hudson 2007). Figure 2 shows a basic WG analysis of a sentence.

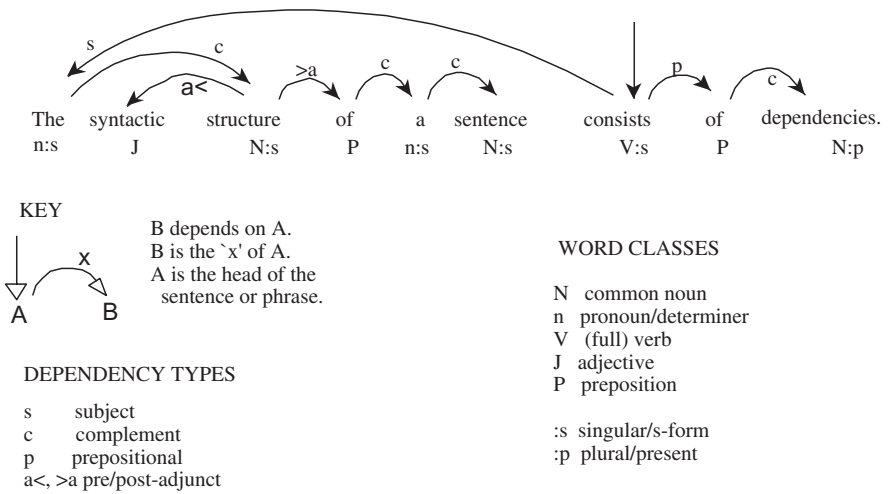

Figure 2: Dependency relations in Word Grammar (reproduced from Figure 9 in Hudson 2006).

Like most dependency grammars, WG is lexically based. The head and the dependent of a dependency link are connected by at least one syntactic rule which specifies properties the two words must satisfy. If these properties are not satisfied, one or more of the syntactic rules linking the two words is violated, which results in ungrammaticality. Figure 2 furthermore illustrates that WG, like the MP (Abney 1987), assumes the determiner to be the head in determiner–noun constructions (Hudson 2004). WG, however, assumes that headedness properties can be distributed across elements, and that the determiner–noun construction involves properties of headedness that are found on

both the noun and the determiner (for more details see Hudson 2004). Figure 2 furthermore illustrates that WG is monostratal, i. e. there is only one structure per sentence.

Features are marginal in WG in comparison with the MP, both in terms of the role they play and their number. WG uses features only for inflectional contrasts that are mentioned in agreement rules, e. g. number but not tense. Features, in WG, are properties of words and handled by default inheritance.[5] In English singular is the default because only plural nouns are marked for plural. Welsh collective nouns, on the other hand, are unmarked: *coed* 'trees', for example, requires a suffix to override this default and make it singular *coed-en* 'tree'. Hudson (2007) suggests that in English, there may be just one morpho-syntactic feature, number. In languages such as German, on the other hand, determiners agree with nouns in terms of the features number, gender and case (for example, *die Frau NOM.F.SG* 'the woman' vs *die Frau-en* NOM.F.PL; *den Student-en* ACC.M.SG vs. *die Frau* ACC.F.PL).

As in the case of the MP, a WG analysis of bilingual speech also does not require CS-specific mechanisms (Eppler 1999: 294). The requirement that "each word in a dependency must satisfy the constraints imposed on it by its own language" (Eppler 1999: 294) constrains both code-switched and monolingual sentences alike. This null hypothesis amounts to the same as MacSwan's (2009: 331) assumption that nothing constrains code-switching apart from the requirements of the specific grammars involved in code-switching.

2.3.3 The Matrix Language Frame model (Myers-Scotton and Jake 1995, 2000; Myers-Scotton 2002)

The Matrix Language Frame model (MLF) as developed by Myers-Scotton (2002) is a model for the analysis of bilingual language production with the main aim of explaining the structural configurations found in code-switching. The MLF model is based on the idea of asymmetrical participation of the languages involved. The MLF stands apart from the other two frameworks examined in the study in that it proposes a separate set of rules that govern bilingual speech because "syntactic models devised for monolingual data do not suffice for explaining code-switching structures" (Myers-Scotton 2002: 14).

5 Default inheritance (a concept from Artificial Intelligence) is a general way of capturing the contrast between 'basic/underlying' patterns and 'exceptions'; particular cases 'inherit' the default pattern unless it is explicitly overridden by a contradictory rule.

One of the main characteristics of the MLF is the opposition of *Matrix Language* and *Embedded Language*. These are two conceptual labels given to the languages in contact. The Matrix Language (ML) is assumed to be the language that supplies the morpho-syntactic frame of the utterance, whereas the Embedded Language (EL) only provides single morphemes or EL islands. In order to identify the ML, two principles are applied which are integral to the MLF and crucial for this study, the *Morpheme Order Principle* and the *System Morpheme Principle*. According to the Morpheme Order Principle, surface morpheme order will be that of the ML. The second principle, the System Morpheme Principle, states that system morphemes with "relations external to their head constituent" (Myers-Scotton 2002: 59) will come from the ML. The ML can be identified unambiguously where the application of both principles points to the same language.

Myers-Scotton and Jake (2000) refine the previously binary content/system classification of morphemes by dividing them into four subcategories, consisting of content morphemes and three types of system morphemes: early system, bridge and late outsider morphemes. These are distinguished from one another by their values on specific features. Their values for the key features are shown in Table 1. As will be seen from the table, content and early system morphemes share the value [+] for the feature +/– conceptually activated,[6] whereas bridge morphemes and late outsider morphemes share the value [–] for this feature. Only content morphemes can receive or assign thematic roles (i. e. the semantic relationships

Table 1: Values of key features for four types of morphemes.

Morpheme type	+/– Conceptually activated	+/– Thematic role assigner/ receiver	+/– Looks outside its own max projection
Content morpheme (e. g. nouns, verbs)	+	+	–
Early system morpheme (e. g. determiners in English)	+	–	–
Bridge morpheme (e. g. *of* in *cup of tea*)	–	–	–
Late outsider morpheme, e. g. subject-verb agreement, case-marking on German determiners	–	–	+

Note: see Myers-Scotton (2002: 73–75).

6 According to Myers-Scotton (2002:74) conceptually activated morphemes "are more directly linked to speaker's intentions than others and are salient at the level of the mental lexicon". In simple terms, they have clear semantic content.

between verbs and their arguments, cf. Myers-Scotton 1993: 7). But for the purpose of identifying the matrix language by means of the System Morpheme Principle, the most important feature is +/– "looks outside its maximal projection", which has a positive value for all morphemes with agreement relations outside their head constituent, like verb inflections which agree with the subject of the verb. This type of morpheme is the only one which must come from the Matrix Language and cannot come from the Embedded Language. In English determiners are early system morphemes and so may or may not come from the Matrix Language, but in German determiners should always[7] come from the Matrix Language since they mark case, which is assigned by the verb of the clause.

A key feature is [+/– conceptually activated] which distinguishes late system morphemes ([– conceptually activated]) from early system morphemes and content morphemes which share the feature [+ conceptually activated]. An additional feature [+/– refers to grammatical information outside of Maximal Projection of Head] distinguishes outsider late system morphemes like subject-verb agreement as encoded in English 3rd person singular *-s* in *he walks*, or case as encoded in German determiners, which have a positive value for this feature, from bridge morphemes like *of* in *a cup of tea*, which have a negative value for this feature. These features are important in determining which morphemes are affected by the System Morpheme Principle, since this only applies to outsider late morphemes, and the prediction is that all outsider late morphemes must come from the matrix language of a clause.

Content morphemes like nouns are viewed as heads[8] of phrases, in which early system morphemes like determiners are seen as adding semantic and pragmatic information to the head. Thus in a phrase like *the dog*, *dog* is a content morpheme and *the* is an early system morpheme which adds definiteness. In languages like German with grammatical gender, the determiner will add information about gender. But in German, determiners also carry case-marking, and case is classified as an outsider late system morpheme. This is because it refers to information outside the noun phrase, since case is seen as being assigned by the verb. Thus the MLF incorporates a strong prediction that German determiners will only occur in mixed nominal constructions when the matrix language is German. In English, where determiners are early system morphemes, the prediction that English determiners will match an English matrix language is less categorical.

7 This claim is supported by Myers-Scotton's (2002: 306) assertion that "In German, verbs and prepositions assign a deteminer's case even though the determiner occurs in a NP".

8 The assumption of the MLF that the noun is head of the nominal construction differs from that of the other two approaches, which see the determiner as head of the DP.

All three frameworks have in common that they take the clause or CP as an important unit of analysis. However, whereas WG deals with the word as a minimal unit and the MP with phrases below the level of the clause, the CP is really the only unit of analysis for the MLF. This does not mean, however, that the MLF cannot deal with clause fragments, since Myers-Scotton (2002: 55) allows for the CP to have null elements, or elements that are understood to be there but which are not overt. Although we recognise that the identification of null elements in CPs may be problematic, we have assumed Myers-Scotton's position in this paper in contrast to the approach taken by Herring et al. (2010) who consider that data in clause fragments cannot be dealt with by the MLF. One consequence of our assumption is that there is no difference between the three frameworks in terms of their coverage of the data: all three frameworks are able to make predictions about the combinations in all mixed determiner–noun constructions in our corpus data.

3 Criteria used for evaluation of predictions

In order to evaluate the three frameworks we compared their predictions regarding the grammaticality of the items in the data. A methodological assumption that we made was that all data items were grammatical, and the percentage of utterances predicted by each framework to be grammatical was interpreted as that framework's degree of accuracy in predicting the data. In other words, if framework/model F predicts that determiner–noun construction DP/NP is not possible, yet DP/NP is instantiated in the corpus data, then determiner–noun construction DP/NP is not ungrammatical (inasmuch as generated by rules), only unpredicted by model/framework F. We outline what the three frameworks (MP, WG and MFL) predict about the combinations in CS determiner–noun constructions in the next sections.

3.1 Minimalist predictions

The determiner in a mixed nominal construction where one of the contributing languages has grammatical gender and the other does not is predicted by the Minimalist approach we have adopted (MacSwan 2005; Moro 2014) to always come from the language that has grammatical gender. As outlined in Section 2.3.1 and above, the Minimalist approach involves feature checking in the process of combining two words like determiner and noun. Where the features

on the determiner and noun are shared, they can be checked and – if they match – deleted. Since the determiner is viewed within Minimalism as the head of the nominal construction or DP, the features on the determiner need to be checked against matching features on the noun. Moro argues that since the English determiner does not have the feature of gender, it cannot be checked against the gender feature on the noun coming from the language with grammatical gender (e. g. German, Spanish, Welsh). The consequence will be that the derivation will crash and hence the sequence is ungrammatical. For this reason the Minimalist approach makes a strong prediction with regard to our corpus data: it predicts that the determiner will always come from the language with grammatical gender in a mixed construction, i. e. German in the case of our data, and the noun from the language without grammatical gender, i. e. English in the case of our data.

3.2 Word Grammar predictions

The units of analysis are individual word-word dependencies in WG, and in this paper we are only looking at determiner–noun dependencies and the predictions made by WG about them.

WG makes use of agreement rules referring to features like number, gender and case. The only feature needed in agreement rules for monolingual English DPs is number. This is because the English language does not have grammatical gender, and WG does not posit a case feature for English.[9] Agreement features operative in German DPs, on the other hand, are number, gender and case.

In standard WG analysis, the determiner is the head in determiner–noun constructions, just as it is in the MP DP analysis. Number and gender are fixed by the noun which is dependent on the determiner, and it is the determiner that has to agree with the features the noun has in a given language (Hudson 2010). Case is determined by the external relation of the determiner to the rest of the clause. For example, case may be nominative if the determiner–noun construction is subject, accusative if it is direct object.

Agreement is handled differently by WG from the way it is handled by the MP. As we saw for the MP, the absence of a feature causes a crash in the derivation: the absence of a gender feature on the English determiner causes a

9 Hudson (1995) proposes a WG analysis according to which differences in case e. g. in the English pronominal system are handled by specific and local lexical rules which are sensitive to syntactic structure but do not involve case.

crash when it is juxtaposed with a gendered noun from another language. In WG, on the other hand, absent features do not cause ungrammaticality. In mixed constructions the requirement for features in dependencies to agree in value only applies to words that have this feature in the language they are from (see WG null hypothesis Section 2.3.2). A mixed determiner–noun construction is therefore only ungrammatical in WG if a feature found in both languages clashes in value, as in e. g. DET_{SG} – N_{PL} : *das_{SG} $children_{PL}$ 'the$_{SG}$ children$_{PL}$'. WG would not allow this combination because there is a clash between the singular number of the German article and the plural number of the English noun. An example like the_{SG} $Schokolade_{F.SG}$ 'the chocolate' by contrast is grammatical according to WG because the English determiner *the* does not have a grammatical gender feature and consequently no clash arises with the grammatical gender feature on the German noun $Schokolade_{F}$.

WG thus predicts both D_E-N_G and D_G-N_E in German/English code-switched constructions. The WG null hypothesis requires each word in a dependency to satisfy the constraints imposed on it by its own language. Number features on the determiner and the noun in a determiner–noun construction should match according to WG rules. English determiners are marked for neither grammatical gender nor case and are therefore free to occur with any German noun, regardless of its gender or case. In the same vein, since English nouns are not marked for grammatical gender or case, they are free to occur with any German determiner.

To summarise, the main difference between the WG and MP predictions is that in the MP the whole derivation crashes if not all agreement features can successfully be checked together by the head (determiner) of the determiner–noun construction. In WG, on the other hand, the agreement features are handled individually; mixed dependencies are predicted as long as there is no overt conflict in feature values of the two lexical items in the syntactic relation. If one of the two languages involved in code-switching does not have this feature, no conflict arises and mixing can proceed without any problem.

3.3 Matrix Language Frame predictions

The Matrix Language Frame predictions follow from Myers-Scotton's Uniform Structure Principle according to which "the structures of the Matrix Language are always preferred" (2002: 8). As described above, the matrix language is identified in the first place by the Morpheme Order and the System Morpheme principles. The preference for structures from the matrix language

is particularly strong for system as opposed to content morphemes, and determiners are system morphemes as we have seen, early system morphemes in English and late outsider morphemes in German. Jake et al. (2002) propose a "Bilingual NP Hypothesis" which they report follows from the Uniform Structure Principle and which makes a specific prediction about determiners: "the system morphemes in mixed NPs come from only one language, called the ML" (Jake et al. 2002: 78). They test their predictions successfully with mixed nominal constructions from English and Spanish, in which determiners are early system morphemes like in English. Our data, however, are from English and German, where – as we pointed out – determiners are outsider late morphemes. Whereas we can expect a preference for early system morphemes to come from the ML, we assume this is a requirement in the case of outsider late system morphemes like German determiners. Thus we expect the predictions of the Bilingual NP Hypothesis to be even stronger in relation to German than to English determiners. This is, we expect that determiners in ML_G constructions to be German; the MLF model also predicts determiners in ML_E constructions to be English, this prediction, however, is slightly less strong.

In our analysis we shall therefore be testing the MLF prediction that the determiner will come from the ML for the clause, as identified by the Morpheme Order and the System Morpheme principles (see Section 2.3.3.). Our method can be illustrated with the following example:

(4) aber er muss jetzt wieder zu einem **assessment** gehen (32)
but he must now again to an.DETID.DAT.M/N.SG N.SG go
'but he needs to go for an assessment again'

The mixed determiner–noun construction here is *einem assessment* 'an assessment', where the determiner is in German and the noun in English. The construction is surrounded by a co-ordinate clause with German word order and German subject-verb agreement. Hence (applying the Morpheme Order and the System Morpheme principles) the ML is German and the German-language source of the determiner *einem* 'an' is in line with the predictions of the Bilingual NP hypothesis.

According to Myers-Scotton and Jake (2000), determiners in English are early system morphemes whereas in German, their case feature depends on the argument(s) of the verb and they are thus late outsider morphemes. Because late outsider morphemes must come from the ML, whereas early system morphemes only preferentially do so, the prediction from a German ML to a German determiner is much stronger than the prediction from an English ML to an English determiner.

4 Data and participants

For this project we extracted all mixed DPs from files Alf (1&2), Spe(1), Hog[10] and Jen1-3 from Eppler's (2003) corpus of German/English spoken interaction. The main patterns of language use in these files are represented in Table 2.

Table 2: Patterns of language use in the files the study is based on.

File (SPEAKERS)	$Words_{German}$	$Words_{English}$	Total
Alf 1&2 (ALA, EAR)	5,805	6,357	12,162
Hog (SOP, FRI)	10,670	646	11,316
Spe (ELI)	65	4,438	4,503
Jen 1–3 (DOR, MEL, TRU, LIL)	28,574	16,804	45,378
Total	45,114	28,245	73,359

The language of interaction is English in Alf 1 (Field Worker (FW) with participant ALA) and German in Alf 2 (with participants ALA and EAR). Hog (with two participants FRI and SOP) is predominantly in German; Spe (with one participant ELI) predominantly in English. Jen1-3 involved four speakers (DOR, TRU, LIL and MEL) who use German as their ML (Luescher 2008). These files constitute 18 hours and 16 minutes. We found a total of 187 mixed determiner–noun constructions.

The data were collected from a community of German-speaking Jewish refugees who settled in London in the late 1930s. All recordings of pairs or groups of speakers were made in the informants' homes by the first author of this paper (FW). At the time the audio-recordings were made, all informants were in their late sixties or early seventies.

The L1 of the German/English participants is Austrian German and all of them received their primary and secondary education in German. The age of onset of the L2, British English, was during adolescence or early adulthood (between ages 15 and 21 years) for all speakers included in this study. Although they had been living in the UK for more than half a century, the speakers selected for this particular study (with the exception of speaker ELI) did not fully immerse themselves in their host culture society (see Duran Eppler 2015), mainly socialised in German-speaking refugee circles, and frequently visited their country of origin.

10 These files have not been used as a database for publications before.

They are proud of their Standard German, *Hochdeutsch* 'High German' (ISpe.cha, line 825) or *Burgtheaterdeutsch* 'Imperial Court Theatre German' (IAlf.cha, lines 559), and made a conscious effort to maintain it. (See Duran Eppler 2010 for more information about the participants and the collection of the data; and Eppler 2003 for the original audio files which demonstrate that all informants included in this sample were still very fluent in German at the time of the recordings.)

The following analysis is based on 187 German/English mixed DPs. In Section 6 we will compare the results with those Herring et al. (2010) record for Welsh/English and Spanish/English for the MP and the MLF model.

5 Analysis

5.1 Testing the predictions

As indicated in the previous section, 187 determiner–noun constructions containing material from both German and English were extracted from the data. The examples included in the data base had to fulfil the following criteria: the determiner–noun constructions must consist minimally of an overt determiner and an overt noun from two different languages. The inclusion of adjectives in the analysis would have been interesting because German attributive adjectives need to agree with the noun and the determiner in gender, number and case. However, attributive adjectives are so rare in our data set (see examples 69, 110,111, 136 such as *eine*$_{ACC.F.SG}$ *fuenfzigjaehrige*$_{ACC.F.SG}$ *reunion* 'a 50th anniversary reunion'[11]) that they were included in the data where they occur, but not specifically analysed. We excluded examples that were ambiguous between German and English, such as *at least a Stunde* 'at least an hour' where the determiner could either be the English determiner *a*, or the German determiner *eine*, which, in unstressed positions, is also pronounced as schwa in colloquial Austrian German. We furthermore excluded proper nouns, such as *die Else und der Bob*, because they are ambiguous between English and German, but not compound nouns, such as *die Handels-akademie* 'the trade academy', where the head (*Akademie*) is not a proper noun and assigns, in this case, feminine gender to the compound. English nouns were checked for loanword status in the Duden, and if listed there, they were excluded from our analysis.

11 Umlauts are transcribed ae, oe, ue because the syntax of the automatic analysis programmes (CLAN) requires ASCI characters.

Our first task was to determine whether the MP, WG and MLF frameworks could make predictions about the individual examples. Herring et al. (2010) found that the MLF covered[2] less data than the MP. However, under the assumption in the present study that the MLF can make predictions about nominal constructions within fragments as well as complete clauses, we find no difference in coverage between the three frameworks. All three frameworks were able to make predictions about all of the data, although with slightly different results. These results show the accuracy of the predictions made by each framework for the data.

5.2 Results – quantitative analysis

In order to arrive at the results of our quantitative analysis we categorised all 187 data items as shown by the four examples in Table 3 below. Examples (7), (19), (2) and (75) in Table 3 are representative of all possible determiner–noun constructions in the corpus this paper is based on. The following interpretation of why these combinations are predicted to be grammatical by some of the three frameworks under evaluation but not by others therefore applies to all examples in the data set.

Table 3: Sample with coding for accuracy.

Mixed determiner–noun construction	MP accuracy	WG accuracy	MLF accuracy
die idioms (7)	Yes	Yes	Yes
die answerphones (19)	Yes	Yes	No
the Handelsakademie (2)	No	Yes	Yes
alle bus[a] (75)	No	No	Yes

Note: [a]The noun *bus* is classified as English on phonetic grounds.

In the first column of Table 3, examples of mixed determiner–noun constructions are listed. The number following each item refers to its number in the Appendix. The appendix can be consulted to find the details of the clausal context of the determiner–noun construction. For example, the appendix shows that *die idioms* 'the idioms' is part of a longer utterance *die idioms and die phrases, das ist kein problem* 'the idioms and the phrases, that's not a problem' which contains two mixed determiner–noun constructions, *die idioms* (7) and *the phrases* (8). *Die idioms* is one of three examples in the table which have a German determiner followed by an English noun. The other two are *die*

answerphones 'the answerphones' and *alle bus* 'all bus'. The construction *the Handelsakademie* 'the trade academy' has an English determiner followed by a German compound noun (see selection criteria Section 5.1).

The second column in the table shows that two of the four examples are accurately predicted by the MP. The first two are fine for the MP because the number, gender and case features on the German determiners (*die* in both cases) can be checked against the (number) features of the English nouns *idioms* and *answerphones* respectively. The features match and can therefore deleted. The derivation can proceeded because the determiners in examples (7) and (19) from the corpus data come from the language that has grammatical gender, as postulated by MacSwan (2005) and Moro (2014). In the case of *alle bus* (75), however, the plural feature of *alle* will cause the derivation to crash when it is checked against the singular feature of *bus* (*bus* is pronounced/bʌs/and classified as an English lexical item on phonetic grounds (see footnote 6); its plural form would therefore be *bus-es*). The example *the Handelsakademie* (2) is also problematic for the MP because the English determiner *the* has no gender, case and number features which can be checked against those of the head noun of the compound *Akademie* which, in the monolingual German version of this determiner–noun construction *is DAT.SG.F* (DAT being assigned by the preposition *bei* 'at'). According to MacSwan's (2005) and Moro's (2014) Minimalist approach to code-switching, the English determiner *the* lacks the uninterpretable features required for checking against the gender and case features on the German noun *Akademie*. These features therefore cannot be deleted and the derivation is expected to crash. Example (2) from our data corpus is thus not predicted by the MacSwan/Moro interpretation of the MP.

The third column of Table 3 shows that three of the four examples are grammatical according to the WG predictions. In the first three examples the features for number on the determiner and noun are compatible: the determiner and noun are both plural in the examples *die idioms* and *die answerphones*, and in the case of the *the Handelsakademie* the German noun is singular while the English determiner is not explicitly marked for number, so that there is no clash of features ($D_{E\ \emptyset}$-$N_{G\ SG.F}$). German a*lle* 'all' in *alle bus* (75) is clearly semantically plural (and it is also more clearly a determiner than English *all*, see Hudson 2010: 254). English nouns are normally marked for plural (with *-s* or *-es*) and singular is the default number. *Bus* is morphologically unmarked (English *bus-es*; *German Bus-e*). The principle of default inheritance thus suggests that *bus* is singular. In example (75) there is thus a clash between the plural feature of *alle* ('all') and the unmarked singular feature of *bus* ($D_{PL} \neq N_{SG}$); for that reason WG would predict this combination not to occur. The argument that absent features do not cause ungrammaticality in WG (Section 3.2) does not apply to example

(75) because number is a morphosyntactic feature of both English and German nouns and should therefore be overtly marked.

In the fourth column of Table 3 we find information relating to the accuracy of the predictions of the MLF. *Die idioms* is part of clause with a German ML, so the MLF predicts the occurrence of the German definite article accurately. *The Handelsakademie* is part of the exchange

(5) *ALA: I had English at school # at the Handelsakademie* (1).
EVA: how many years ?
ALA: four years.
ALA: well yes I think # four years at the Handelsakademie (2).

where the subject-verb agreement allows us to identify the ML as English. As outlined in Section 3.3, the MLF predicts that the determiner will be English also because English determiners are early system morphemes according to Myers-Scotton and Jake's (2000) classification. They are [+conceptually activated], i. e. add definiteness in this case, but do not [-] refer to grammatical information outside the Maximal Projection of Head, like the case encoded in German determiners. The MLF prediction for the determiner to be English in example (2) is therefore accurate but not as strong as for German determiners. The MLF prediction regarding the grammaticality of example (75) is also supported by the data. *Alle bus* is the subject of the clause *alle bus waren voll ab* 'all buses were full up'. This clause has German ML because of the subject-verb agreement, which indicates plural (SG. would be *der bus ist voll ab*), and the determiner *alle* is indeed German as the ML would predict. Finally, the MLF is shown to be inaccurate in its predictions for *die answerphones*. This determiner–noun construction is part of a clause which, although incomplete (*ja weil die answerphones are not* ..., meaning 'yes, but the answerphones are not ...') has enough information for us to identify the matrix language as English on the basis of the subject-verb agreement. This would lead us to expect the language of the determiner to be English, but it is in fact German. The argument that the MLF predictions say more about the (Matrix) language of the utterance than about the grammaticality of the determiner–noun constructions in question will be discussed in Section 6.

Table 4 presents the accuracy of the predictions made by all three frameworks under evaluation in this paper for our corpus data of 187 mixed German/English and English/German determiner–noun constructions.

Table 4 shows the accuracy of the predictions made over our corpus. The predictions made by the Minimalist Programme were accurate over 94.65 % of the data while the Word Grammar prediction had a 99.47 % accuracy. The MLF prediction was

Table 4: Accuracy of predictions of the MP, WG and the MLF model for mixed determiner–noun constructions (raw observed frequencies and percentages).

	MP	WG	MLF
Accurate	177/187 (94.7 %)	186/187 (99.5 %)	182/187 (97.3 %)
Not accurate	10/187 (5.4 %)	1/187 (0.5 %)	5/187 (2.7 %)

accurate for 97.33 % of the corpus. A chi square test comparing the accuracy of predictions across the different models indicated that there was a difference in accuracy between the three models ($p = 0.02$).[12] Further analysis of pairwise comparisons (adjusted for multiple comparisons using the Bonferroni correction) indicated that there was a significant difference between the MP and WG ($p = 0.006$) but not between WG and the MLF ($p = 0.1$) or the MLF and MP ($p = 0.188$).[13]

Figure 3 presents a graph showing the percentage of overlap in the predictions between the MP, WG and the MLF model. It shows that a high percentage of cases was accurately predicted by all three models.

6 Discussion

In this section we will comment on the similarities and differences between the results achieved for the three frameworks, and will discuss the implications.

12 Expected Values for Chi Square

(overall comparison)	MP		WG	MLF	
	yes	181.667	181.667	181.667	545
	no	5.333	5.333	5.333	16
		187	187	187	561
	p =	0.019753	overall		

13 Expected alues for Chi Square

(pairwise comparison)	MP	WG	WG	MLF	MP	MLF
	181.5	181.5	184	184	179.5	179.5
	5.5	5.5	3	3	7.5	7.5
	p =	0.00588	*p* =	0.09971	*p* =	0.18761

Note that the expected frequencies for the WG vs. MLF comparison are less than 5.

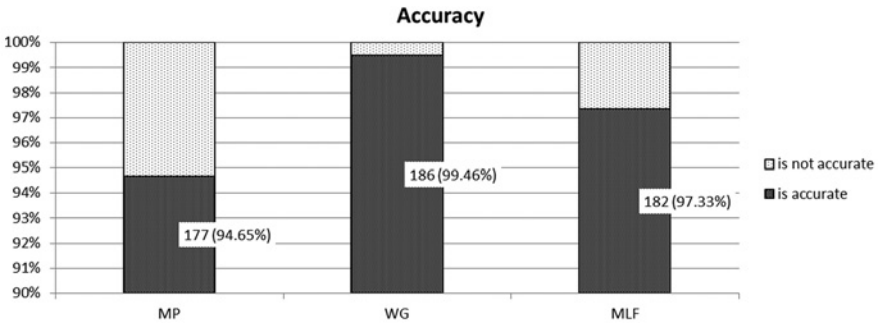

Figure 3: Accuracy of predictions (N = 187).

Table 4 and Figure 3 show that all three frameworks have high levels of accuracy but it is interesting that no inaccurate predictions are common to all three. The MP and WG agree in failing to predict item 75 (*alle bus waren voll ab*) where the problem for both frameworks is the mismatch between plural determiner and singular noun. In order to be grammatical in both frameworks the noun would either have to be marked with the English plural morpheme *–es* or the German nominative plural morpheme *-e* in order to agree in number with *alle* ('all'). Jake et al. 2002: 2) refer to the importance of congruence between features in mixed constituents, stating that "congruence checking at the lemma level verifies that the abstract structures projected by a content morpheme ... of the EL are congruent enough to be inserted into a constituent of the ML". However, they also state that where "congruence between the features of the participating languages is missing ... the derivation does not crash and it is resolved in favour of the ML". Since item 75 has German as its ML and, as the MLF would predict, the determiner is also German, the MLF assumes that the overall number feature on the determiner–noun construction is plural, despite the form of *bus*.

The MP is inaccurate about all mixed determiner–noun constructions where English provides the determiner. However, these constructions account for 5/187 or less than 3% of the data. If English were to be used more frequently as the ML of the conversations, then we would expect many more mixed constructions with an English determiner and thus a lower level of accuracy for the MP. The same situation arose with the data analysed by Herring et al., where the relatively high accuracy of the MP may have been attributable to the fact that the gendered language (Welsh or Spanish) combined with English was usually the language providing the morphosyntactic frame (see also Liceras et al. 2008). As we have seen, the same pattern applies in the German–English data.

We have seen that a comparison of the MP and WG in terms of accuracy shows that WG scores are significantly higher than the MP. Unlike the MP,

WG does not predict an absence of English determiners in German/English code-switched data and this is one reason for its higher level of accuracy when compared to the MP. The predictions of WG only turn out to be inaccurate where there is a mismatch of features and this happens only in example 75, discussed above. The other reason for the significant difference in accuracy levels between WG and the MP is the MP postulation that features form a bundle which needs to be checked together, in "one fell swoop" (Chomsky 2000: 124). MacSwan (2005) and Moro (2014) subscribe to this assumption in their work on the application of the MP to code-switching. González-Vilbazo (2005) however, also working within the MP, does not assume that phi-features form a bundle in his study of gender assignment to German/Spanish code-switching. His Gender Assignment Algorithm assumes that "der Artikel aus L2 keine Genusmerkmale haben darf, die das Nomen in L2 nicht selbst auch hat" [the L2 article must not have gender features that the L2 noun does not have itself] (p. 169). Under this interpretation of the MP, both syntactic theories would achieve the same accuracy levels because absent features would no longer cause the derivation to crash (see Sections 3.1 and 3.2 and concluding remarks).

The MP and WG have in common that both approaches are committed to dealing with code-switching data without appealing to code-switching-specific mechanisms. As MacSwan (2009: 325) puts it, "only the minimal theoretical assumptions may be made to account for linguistic data, privileging more simplistic and elegant accounts over complex and cumbersome ones. These assumptions would naturally favour accounts of CS that make use of independently motivated principles of grammar over those that posit rules, principles, or other constructs specific to it". Since both the MP and WG are lexically based, the selection of two syntactically related words from two different languages involves the application of principles or constraints specific to the lexicon of each language. As we have seen, conflicting values of the same feature cause a problem where agreement between words is necessary, but where there is no conflict, then code-switching can freely occur according to WG and at least one version of the MP (cf. González-Vilbazo 2005).

This absence of code-switching-specific mechanisms is seen to be ideal by the proponents of MP and WG, whereas the principles of the MLF (e. g. the Uniform Structure Principle and the System Morpheme Principle described above) are considered by some to be unnecessarily cumbersome "on grounds of scientific parsimony" (MacSwan 2005: 1). However, while we agree that theoretical parsimony is certainly a goal to be upheld, it has to be balanced against empirical accuracy. The observation due to the MLF of the co-occurrence relation between the source language of a determiner and of the verb in the same clause will need to be accounted for in any fully accurate theory.

Åfarli et al. (2013) argue against the idea (upheld by WG and MP) that all grammatical information is included in the lexicon, pointing to recent work in the so-called constructivist tradition, which "emphasizes the role of syntax in constructing meanings traditionally attributed to argument structure" (Marantz 2013: 154). Åfarli et al. take the position "that there is a kind of syntactic frame that exists independently of the lexical items that are inserted into the frame" (Åfarli et al. 2013: 14). This approach takes explicit account of any co-occurrence relations between determiners and verbs of the kind we have found in our data. Like Myers-Scotton, Åfarli et al. find empirical support for the assumption of an asymmetry between the two participating languages, but prefer (on empirical grounds[14]) not to assume that the syntactic frame and system morphemes must come from the same language. They argue that a generative Syntactic Frame Model (SFM) will capture the insights of the MLF while overcoming its weaknesses. In particular, they suggest that it will meet criteria of parsimony by accounting equally for monolingual and bilingual data, and that in this sense it is a Null Theory. The SFM "agrees with the MLFM that (i) Frames are generated independently of lexical items, and (ii) lexical insertion takes place late in the derivation" (Åfarli et al. 2013: 15). However, the SFM differs from the MLF in that there is no requirement for the functional system morphemes to come from the same language as that of the syntactic frame. According to the SFM, "functional morphemes are inserted into the frames like lexical content morphemes", but at an earlier stage.

In comparing the application of our three frameworks to the data, we have seen that there was not a large difference in their accuracy; we have also seen that they made predictions about different aspects of the data. A theory is therefore needed which can successfully handle all these aspects. WG and the MP deal mainly with agreement between the features of the determiner and noun, whereas the MLF deals mainly with agreement in language between the determiner and the finite verb. One could argue that the MLF predictions say more about the language of the elements in an utterance than about the grammaticality of the determiner–noun construction.

For WG, on the other hand, agreement in language is not important, but agreement in the syntactic requirements of the two words involved in the dependency is. Because of this one could argue that it overgenerates by

14 In their analysis of Dakkhini, an Indian contact language, Åfarli et al. show that this language upholds the MLF idea of an asymmetry between languages, but that the grammatical structure of Dakkhini comes from a different language (Telugu) from the language of its lexical items (Hindi/Urdu).

accepting utterances (19, 33, 81, 113, 143) that lack agreement between the language of the determiner and the finite verb. The same comment could be made about the MP, with the additional problem that this model disagrees with both WG and the MLF in rejecting the grammaticality of all DPs containing an English determiner and a German noun. This is a consequence of our adopting a Minimalist model which assumes that the language with grammatical gender (German in our data) always supplies the determiner. As we have pointed out, adopting the version of Minimalism assumed by González-Vilbazo would solve this problem. On similar grounds one could argue that the MLF model overgenerates by accepting constructions that do not display overt agreement in features, such as *alle bus*.

In order to achieve an optimal theory it seems to us that insights from all three frameworks should be incorporated. Detailed attention to features (of the kind found in both WG and the MP) and how they work in agreement will be an important part of this theory, but consideration should also be given to abandoning a strict version of lexicalism and adopting constructionist approaches.

One remaining issue is whether it is sufficient to limit ourselves to naturally occurring corpus data. As is well known, one drawback of any work using naturalistic data is that we do not have negative evidence, or evidence regarding combinations which do not occur because they are ungrammatical. Furthermore, some (usually infrequent) constructions may be errors and considered ungrammatical by others. Much work in syntax has preferred to use grammaticality judgments from native speakers rather than naturalistic data, but judgments regarding mixed language combinations are particularly problematic since they tend to be affected by prescriptive norms and to be more negative than would otherwise be the case (see Parafita Couto et al. 2013). However, recent advances in neuroscience have made it possible to test participants' unconscious reactions to grammatical and ungrammatical sequences. A study by Parafita Couto et al. (2013), for example, made use of neuroscientific techniques to elicit brain responses to various code-switched combinations using Welsh-English stimuli. Preliminary results showed that those stimuli that were counter to MLF predictions but in line with MP predictions gave rise to an anterior negativity (associated with a syntactic violation). This was not the case with predictions which were counter to the MP. However, the results were not so clear cut for stimuli which agreed with the predictions of both models. Nevertheless, these new techniques may be useful in the future for studying the grammaticality of code-switching sequences since they do not involve conscious judgments.

7 Conclusion

In comparing the predictions of three frameworks regarding the grammaticality of 187 mixed German–English nominal constructions we found some differences, but there was a significant difference only between WG and the MP. We noted, however, that there were no utterances considered to be ungrammatical by all three frameworks, and that whereas the WG and the MP focused on agreement in features between the determiner and the noun, the MLF was more concerned with agreement in language between the determiner and the language of the finite verb. This led us to consider ways of combining the insights of all three frameworks in order to consider agreement both in features and in language, but while retaining theoretical parsimony (see Section 6).

It is possible that other models could achieve higher levels of empirical adequacy than those we have compared. For example González-Vilbazo's minimalist approach to code-switching would be expected to achieve a higher accuracy level for the construction type under evaluation in this paper because it does not postulate that features form a bundle which needs to be checked in "one fell swoop". If features on a determiner from one language and a noun from another language need not be checked together, the head of the determiner–noun construction does not need to be provided by the language with more features (gender, case, number). Consequently D_E-N_G combinations, for example, would be accurately predicted by this interpretation of the MP. More generally, without the "one fell swoop" postulate for feature checking cross-linguistic differences in features do not cause the derivation to crash, which results in higher accuracy levels.

Åfarli et al.'s SFM model might be expected to result in a higher accuracy level than the MLF model for certain kinds of data (though not our own) because it does not assume that the syntactic frame and system morphemes must come from the same language. The MLF model postulates that the determiner in a determiner–noun construction should come from the same language as that which provides the syntactic frame. As the SFM model does not have this requirement, the system morpheme, i. e. the determiner in the construction type under evaluation in this paper, and the syntactic frame need not be provided by the same language. The language of the determiner, however, needs to match the language of the other system morphemes in the SFM model. As this is not the case our data, the SFM model would not be expected to result in a higher accuracy level for our corpus than the MLF model.

In the spirit of Kuhn (1970) we therefore conclude that combining the insights of competing paradigms within linguistics theory is an aim for the future, and expect that interdisciplinary research between corpus and theoretical linguists as well as neuroscientists may help to bring the goal closer.

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Appendix 1: Data Set

#	Determiner – noun construction	Clause	file
1	the@s Handels + akademie	I@s had@s English@s at@s school@s # at@s the@s Handelsakademie.	alf
2	the@s Handels + akademie	well@s yes@s I@s think@s # four@s years@s at@s the@s Handelsakademie.	alf
3	the@s C_A	so # there@s was@s somebody@s in@s the@s C_A [Creditanstalt]	alf
4	diese idioms@s	zweitens waren wir doch nicht gewoehnt an diese idioms@s and@s das colloquial@s English@s	alf
5	das colloquial@s English@s	zweitens waren wir doch nicht gewoehnt an diese idioms@s and@s das colloquial@s English@s	alf
6	das vocabulary@s	das vocabulary@s ist kleiner,	alf
7	die idioms@s	die idioms@s und die phrases@s # das ist kein problem	alf
8	die phrases@s	die idioms@s und die phrases@s # das ist kein problem	alf
9	die Anglo + Austrian Society@s	wir sind auf ihn # gekommen durch die Anglo_Austrian@s society@s	alf
10	von der Anglo + Austrian Society@s	und dann war er hier in London bei einer # A_G_M # von der Anglo_Austrian@s Society@s [Annual General Meeting]	alf
11	diese oral@s histories@s	und er hat also diese oral@s histories@s gemacht in England in Amerika und in Israel von verschiedenen [//] von sogar sehr beruehmten leuten #	alf
12	die principal@s	und eines tages ruft mich die # ja die principal@s von dem kindergarten	alf
13	(da)s tape@s	das wird sie vielleicht interessieren # nicht unbedingt fuer (da)s tape@s.	alf
14	ein chimney + sweep@s	der lehrer das war ein chimney@s sweep@s.	alf
15	meine roots@s	meine roots@s,, ja ?	alf

(*continued*)

(*continued*)

#	Determiner – noun construction	Clause	file
16	am tape + recorder@s	aber wir klingen alle schrecklich am tape@s recorder@s	alf
17	eine message@s	wenn ich eine message@s lass bei meiner tochter auf ihrem answer@s phone@s, #	alf
18	auf ihrem answer + phone@s	wenn ich eine message@s lass bei meiner tochter auf ihrem answer@s phone@s, #	alf
19	die answer + phones@s	ja weil die answerphones@s are@s not@s/.	alf
20	kein &ti@s &eitʃ@s	und deswegen kann ich kein &ti@s &eitʃ@s und kein dʌblju:@s sagen ?	alf
21	kein &dʌblju:@s	und deswegen kann ich kein &ti@s &eitʃ@s und kein dʌblju:@s sagen ?	alf
22	in der resistance@s	" ich war nicht in der resistance@s.	alf
23	auf der winning@s side@s	er wollte immer auf der winning@s side@s sein.	alf
24	am Austrian@s Institiute@s	wir haben am Austrian@s Institute@s hier einen jungen mann kennengelernt	alf
25	an der Saint@s Paul's@s girls'@s school@s	und hat an der Saint@s Paul's@s girls@s school@s als language@s assistant@s Deutsch unterrichtet.	alf
26	an einem # college@s	und hat schon einen posten jetzt gehabt hier an einem # college@s.	alf
27	keine opinions@s	keine eigenen gedanken [//] keine opinions@s.	alf
28	im Austrian@s Institute@s	die da spielen im Austrian@s Institute@s ?	alf
29	sein *A* + level@s	und der bub macht jetzt sein A_level@s [Advanced Level]	alf
30	dieses dyslexic@s	das hat einen schrecklich langen # namen dieses dyslexic@s,,	alf
31	in einer Quaeker@s boarding + school@s	er war in einer Quaeker@s boarding@s school@s,	alf
32	zu einem assessment@s	aber er muss jetzt wieder zu einem assessment@s gehen.	alf
33	mein vocabulary@s	mein vocabulary@s in@s English@s is@s not@s [/] not@s so@s many@s hundred@s thousand@s words@s	alf
34	vom Goethe@s Institute@s	ich hab(e) heute vom Goethe@s Institute@s das programm bekommen.	alf
35	so einen accent@s	and@s alle haben wir so einen accent@s #	bro
36	so (ei)n continental@s club@s	[ist] halt so (ei)n continental@s club@s # and@s	bro

(*continued*)

(*continued*)

#	Determiner – noun construction	Clause	file
37	diese exchange@s	sie machen doch diese Anglo + Austrian [//] diese exchange@s	bro
38	zu der ball@s pen@s	wie sagen sie zu der ball@s pen@s ? [ballpoint pen]	bro
39	ein counter@s	und da is(t) ein [/] ein counter@s mit brot.	bro
40	dieses continental@s rye@s	[da] haben sie dieses continental@s rye@s	bro
41	so ein bread@s counter@s	rueckwaerts an der seite is(t) so ein bread@s counter@s	bro
42	eine # blockage@s	[sie...hat] so eine # blockage@s,, you@s know@s	bro
43	in ein mental@s home@s	und [sie] ist gekommen in ein mental@s home@s.	bro
44	(ei)ne nurse@s	und sie war (ei)ne nurse@s.	bro
45	zum Austrian@s Centre@s	weil sie hat nie gehoert xxx zum Austrian@s Centre@s xxx.	bro
46	den contact@s	irgendwie ### man hat nicht so den contact@s gehabt.	bro
47	die nurses@s	die haben sie ja nicht verstanden # die nurses@s,, nicht?	bro
48	in einen mental@s ward@s	und haben sie in einen mental@s ward@s	bro
49	in dem district@s	ja aber es is(t) nur hier in dem district@s,	bro
50	ein day + centre@s	das ist so ein day@s centre@s.	bro
51	fuer die company@s	und vor allem jeder xxx fuer die company@s.	bro
52	den accent@s	, dass wir alle noch den accent@s haben.	bro
53	(de)n accent@s	, niemanden, der (de)n accent@s verloren hat.	bro
54	den accent@s	dann verliert man den accent@s.	bro
55	in ein hostel@s	hat man sie in ein hostel@s geschickt nach Manchester@s.	bro
56	den northern@s accent@s	sie hat noch immer den northern@s accent@s von Manchester@s	bro
57	all@s the@s schlager	all@s the@s schlager vom jahre thirtyfour@s fourtyfive@s...	bro
58	im House@s of@s Lords@s	die ist jedes jahr im House@s of@s Lords@s.	bro
59	im Rutland@s Gate@s	das ist im Rutland@s Gate@s, nicht im Leighton@s House@s.	alf
60	im Leighton@s House@s	das ist im Rutland@s Gate@s, nicht im Leighton@s House@s.	alf
61	im Leighton@s House@s.	das ist im Leighton@s House@s.	alf
62	im Leighton@s House@s	ah im Leighton@s House@s wieder.	alf
63	im Leighton@s House@s	im Leighton@s House@s,, ja.	alf
64	am Bellsize@s Square@s	ich hab(e) dort gewohnt am Bellsize@s Square@s.	bro

(*continued*)

(*continued*)

#	Determiner – noun construction	Clause	file
65	ein quiz@s	heute is(t) sogar ein quiz@s dort.	bro
66	in einer farm@s	und war sie dort in einer farm@s.	bro
67	bei dem polish@s do@s	ich glaub(e) wir waren bei dem polish@s do@s.	jen3
68	bei der reunion@s	bei der [/] bei der reunion@s ?	jen3
69	eine fuenfzigjaehrige reunion@s	im achtundachziger jahr # hab(e) ich gemacht eine fuenfzigjaehrige reunion@s.	jen3
70	vom Austrian@s Centre@s	waren alle vom Austrian@s Centre@s # in Wien.	jen3
71	meine hip + operation@s	ich hab(e) gerad(e) gehabt meine hip + operation@s.	jen3
72	der receptionist@s	was sich der receptionist@s denkt, wenn er liest ".	jen3
73	von der Green@s Street@s	er ist doch von der Green@s Street@s gekommen.	jen3
74	auf ein-0* bus@s	dann haben sie muessen warten auf ein bus@s [pho: bʌs] xxx	jen3
75	alle bus-0*@s	alle bus@s [pho: bʌs] waren voll ab.	jen3
76	am airport@s	ja # sie wollten (da)s taxi am airport@s/.	jen3
77	die travelcard@s	hat sie g(e)sagt sie hat die travelcard@s.	jen3
78	ne [: eine] travelcard@s	nein nein# sie hat ne [: eine] travelcard@s.	jen3
79	in der Finchham@s Avenue@s	schau # die wohnt in der Finchham@s Avenue@s # die mit dieser crooked@s nose@s,, nicht ?	jen3
80	mit dieser crooked@s nose@s	schau # die wohnt in der Finchham@s Avenue@s # die mit dieser crooked@s nose@s,, nicht ?	jen3
81	beide kings@s	aber beide kings@s is@s a@s bit@s of@s a@s...	jen3
82	der trouble@s	ja # das is(t) ja der trouble@s...	jen3
83	die buss-es@s	und [>] die buss-es@s sind nicht gegangen.	jen3
84	auf (de)m record@s	das is(t) auf (de)m record@s drauf.	jen3
85	diese bible@s	musst du@s dir s(ie) wieder durchlesen # diese bible@s.	jen3
86	eine singleton@s	einmal hab(e) ich gekriegt eine singleton@s # und eine goar nix [= ueberhaupt nichts].	jen3
87	ein void@s	na # das is(t) ein void@s.	jen3
88	den exit@s	und das aergste war xx damals wo sie den exit@s mitg (e)habt hat ...	jen3
89	von einer lorry@s	sie is(t) ueberfahren worden # hab(e) ich gelesen in der zeitung # von einer lorry@s.	jen3
90	im prison@s	die das kind hat von dem, der im prison@s is(t).	jen3
91	mit der cruise@s	aber nicht mit der cruise@s, das is(t) wieder different@s.	jen3
92	ein joker@s	das is(t) ein joker@s ?	jen3

(*continued*)

(*continued*)

#	Determiner – noun construction	Clause	file
93	keine skin + trouble@s	ja eh # aber keine skin + trouble@s geh(e)n weg in einer woche.	jen3
94	den spray@s	die hat den [/] den spray@s # hat sie ganz ge#kruste-t # und die kruste muss herunterkommen.	jen3
95	die points@s	sie muss noch die points@s zaehlen.	jen3
96	die cards@s	aber die Fritzi # immer hat sie die cards@s am tisch g (e)habt, wenn sie s(ie) haett(e) in der hand haben sollen.	jen3
97	in (da)s hospital@s	irgendwas hat sie in (da)s hospital@s g(e)fahren.	jen3
98	der joker@s	wo is(t) der joker@s ?	jen3
99	der joker@s	da ist der joker@s.	jen3
100	ein letter + heading@s	das ist doch ein letter + heading@s...	jen1
101	in der drawer@s	den kalender den hab(e) ich noch in der drawer@s.	jen1
102	auf der settee@s	und es is(t) auf der settee@s g(e)standen.	jen1
103	(eine)n check@s	gib ihr (eine)n check@s.	jen1
104	einen shopping@s trolley@s	denn ich hab(e) einen shopping@s trolley@s gehabt -..	jen1
105	der quiz@s	es war ja der quiz@s und da waren alle...	jen1
106	im quiz@s	ich hab(e) gehoert, ihr habt gewonnen im quiz@s [*] ?	jen1
107	kein microphone@s	sie braucht doch kein microphone@s.	jen1
108	ein quiz@s	[!] dort [//] wenn wir ein quiz@s haben,.	jen1
109	dem quiz@s	das sind doch nur englaender # dort wo ich zu dem quiz@s gehe ...	jen1
110	den selben rubbish@s	genau den selben rubbish@s wie frueher.	jen1
111	die neue production@s	da kommt schon die neue production@s.	jen1
112	ein new@s cook@s	hat sie g(e)sagt dass ein new@s cook@s jetzt in@u Cleve@s Road@s is(t)@u.	jen1
113	am sunday@s	we@s had@s very@s nice@s lunch@s am sunday@s.	jen1
114	im choir@s	die Jean@s hat auch mitgesungen im choir@s ## but@s she@s didn't@s have@s a@s solo@s.	jen1
115	den boyfriend@s	is(t) aber auch zeit # den hat sie doch schon zehn jahr (e) den boyfriend@s ...	jen1
116	an ein Indian@s doctor@s	und der hat an ein@s Indian@s doctor@s verkauft.	jen1
117	die value@s	und da waren die [//] da haben sie nichts g(e)sprochen miteinander -. because@s wenn du es verkauft [/-] also die value@s vom haus@s sinkt doch,, net [: nicht] ?	jen1
118	den district@s	aber den district@s, der hier ist # sind sehr viele continental@s leute.	jen1

(*continued*)

(*continued*)

#	Determiner – noun construction	Clause	file
119	einer # A_G_M@s	und dann war er hier in London bei einer # A_G_M # von der Anglo_Austrian Society@s [Annual General Meeting]	alf
120	dieser noise@s	was ist das # dieser noise@s ?	jen1
121	am telly@s	heute war die tochter von der Marlene Dietrich am telly@s.	jen1
122	deinen mistake@s	aber da machst du deinen mistake@s.	jen1
123	im freezer@s	hast du was im freezer@s ?	jen1
124	am tape@s	weisst du dass du jetzt am tape@s bist@s dass du hingehen musst.	jen1
125	die joker-s@s	jetzt xxx lucky@s mit die joker-s@u.	jen1
126	der caretaker@s	der caretaker@s	jen1
127	den trolley@s	kannst du den trolley@s den huegel rauf xx ?	jen1
128	an [: einem] microphone@s	mit an [: einem] microphone@s haett(e) sie (e)s sagen muessen.	jen1
129	der husband@	von der Caroline@s der husband@s ?	jen1
130	einen mistake@s	oh gott # schon wieder einen mistake@s gemacht # aber ich kann anlegen, einen vierer.	jen1
131	dein cab@s	, dein cab@s # hast du bestellt um halb zwoelf ?	jen1
132	unsere personality@s	yea@u I@s think@s das ist unsere personality@s.	jen1
133	all@s these@s doppelten	Lilly@s with@s all@s these@s doppelten.	jen1
134	zwei penny@s	gestern xx haben wir gespielt ein penny@s und zwei penny@s.	jen2
135	in der Boundary@s Road@s	da in der Boundary@s Road@s # mit jemand anderem haben wir gespielt.	jen2
136	das andere interview@s	was war das andere interview@s ?	jen2
137	von der beach@s	brise von der beach@s.	jen2
138	die computer@s	du jetzt, seit die computer@s sind +...	jen2
139	der computer@s	na der computer@s weiss (e)s noch nicht.	jen2
140	beim computer@s	aber beim computer@s nie@s.	jen2
141	dem computer@s	nein # because@s dem computer@s brauchst es@s ja nicht zeigen.	jen2
142	die card@s	ich hab(e) immer mussen die card@s +...	jen2
143	kein-e possibilities@s	kein-e possibilities@s you@s had@s ?	jen2
144	die concentration@s	die concentration@s.	jen2
145	die kitty@s	xxx [>] in die kitty@s.	jen2
146	die kitty@s	in die kitty@s [<].	jen2
147	das storm + setting@s	sag(e) M,, du weisst auch nicht wann das storm + setting@s is(t),, nein ?	jen2

(*continued*)

(*continued*)

#	Determiner – noun construction	Clause	file
148	eine waiting@s list@s	sollen sie herkommen, damit sie wissen, was eine waiting@s list is(t).	jen2
149	beide jokers@s	xxx [>] haett ich beide jokers@s gehabt im umtausch +...	jen2
150	die roasts@s	auch die roasts@s haben besser ausg(e)schaut.	jen2
151	der husband@s	wer # der husband@s ?	jen2
152	diese prostrate@s gland@s operation@s	ja er muss ins spital fuer diese prostrate@s gland@s operation@s.	jen2
153	zur Cleve@s Road@s	ich komm am donnerstag zur Cleve@s Road@s.	jen2
154	den karo jack@s	den karo jack@s hast du gekauft ?	jen2
155	die sandwiches@s	die sandwiches@s, die wir gehabt haben +...	jen2
156	am telly@s	ich muss sagen, am telly@s war (e)s nicht dasselbe.	jen2
157	im bus@s	wir reden oft so laut auf deutsch, you@s know@s, wenn wir in der elektrischen fahren # oder im bus@s fahren.	jen2
158	(de)m bus@s	kann man nicht einmal hinfahren, mit (de)m bus@s.	jen2
159	am telly@s	na unlaengst am telly@s.	jen2
160	am telly@s	es verliert sehr viel am telly@s.	jen2
161	die kitty@s	das ist in die kitty@s	jen2
162	mein-0* phone + number@s	ich hab(e) ihnen nachher # hab(e) ich ihnen mein-0* phone + number@s ## and@s we@s are@s getting@s together@s again@s	jen1
163	eine identitaets + card@s	dass es eine identitaets + card@s geben wuerd(e)	hog
164	im pioneer + corps@s	ja ich war im pioneer + corps@s ja zuerst	hog
165	ein day + centre@s	ach nur ein day + centre@s [>]	hog
166	ein day + centre@s	nur ein day + centre@s,, ja	hog
167	im Austrian@s Centre@s	im krieg durch waren xxx im Austrian@s Centre@s hier	hog
168	der London@s University@s	an der London@s University@s [//] an der University@s of@s London@s +/.	hog
169	der University@s of@s London@s	an der London@s University@s [//] an der University@s of@s London@s +/.	hog
170	im day + centre@s	die leute im day + centre@s sind mehr +...	hog
171	eine drug + factory@s	wir haben eine drug + factory@s oben	hog
172	der editor@s	denn ich hab gedacht der editor@s von dem A_J_R@s journal@s.	hog
173	dem A_J_R@s journal@s	denn ich hab gedacht der editor@s von dem A_J_R@s journal@s.	hog
174	der Finchley@s Road@s	xx von der Finchley@s Road@s.	hog
175	dem hostel@s	sind sie in dem hostel@s ?	hog

(*continued*)

(*continued*)

#	Determiner – noun construction	Clause	file
176	die Q_M_S@s school@s	wo die Q_M_S@s school@s ist.	hog
177	die Q_M_S@s	das ist in der naehe wo die Q_M_S@s ist.	hog
178	kein work + permit@s	dann haben wir kein work + permit@s gehabt.	hog
179	ein permit@s	da kriegt man ein permit@s	hog
180	the direktor@s	we shared the house with the direktor@s of the kunsthistorische@s museum@s.	spe
181	the kunsthistorische@s museum@s	we shared the house with the direktor@s of the kunsthistorische@s museum@s.	spe
182	the firma@s	we have parents there and the firma@s ehm@u [//] the firm	spe
183	the konditorei@s	all we ever learnt was how to ask things in the konditorei@s	spe
184	das Leighton@s House@s	das Leighton@s House@s ?	alf
185	ein day + centre@s	nein das ist eigentlich nur ein day@s centre@s.	alf
186	ein day + centre@s	nur ein day@s centre@s.	alf
187	andere seaside + places@s	aber andere seaside + places@s haben auch	jen2

Appendix 2: Transcription Symbol Summary (CHAT/LIDES)

@s	English word or word-form
@u	unspecified word or word-form
xxx	unintelligible speech, not treated as a word
xx	unintelligible speech, treated as a word
&	phonological fragment
0	non-completion of a word
#	prefix marker
+	compound or rote form marker
-0*	(incorrectly) omitted affix
.	period; falling intonational contour
?	question; rising intonational contour
,	syntactic juncture
„	tag question
/	stress
//	accented nucleus
+...	trailing off
+/.	interruption

[!]	stressing
[: text]	replacement
[>]	overlap follows
[<]	overlap precedes
[/]	retracing without correction
[//]	retracing with correction
[/-]	false start without retracing
[*]	error marking
[+ text]	postcode

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